Remarks/Arguments:

Interview Summary

A telephonic Examiner Interview was conducted on April 1, 2008. Examiner Samuel M. Heinrich and Applicant's representative Lowell L. Carson participated.

Applicants invention was discussed, specifically the feature of controlling the shape of an area machined by a laser by adjusting the polarization of the pulse of laser light without changing the intensity profile (i.e. cross-sectional shape) of the pulse of laser light at the beam spot.

The Examiner allowed that he had not fully appreciated this feature as it was recited in the claims.

Applicant's Representative allowed that, while the previously presented claims recite that the pulse of laser light is focused to a beam spot that has "a substantially circularly symmetric beam intensity profile," these claims do not explicitly recite that the "substantially circularly symmetric beam intensity profile" is maintained while the polarization is adjusted.

Amendments to the claims clarifying that "substantially circularly symmetric beam intensity profile" is maintained while the polarization is adjusted in Applicant's invention were also discussed.

Pending Claims

Claims 1-3 and 28 are pending. Claim 1 has been amended to explicitly recite that intensity profile of the pulse of laser light is maintained throughout adjustment of the polarization of the pulse of laser light. No new subject matter has been added.

Claim Rejections

Claims 1-3 and 28 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ehrmann et al. (US Patent Application Publication No. 2002/0170898 A1) in view of Yano et al. (US 5,293,389) and either Nishisaka (JP 357097886A) or Dunsky et al. (US 6,433,301). Applicants respectfully submit that claims 1-3 are not subject to these rejections for the reason set forth below.

As stated in the Office Action (page 2, second paragraph), Ehrmann et al. disclose the use of "modified elliptical spots" (i.e. spots having a non-circular beam intensity profile) to improve processing speed. Paragraph [0104]. Ehrmann et al. disclose several approaches to forming these modified elliptical spots. For example, paragraph [0144] discloses, with reference to Fig. 22, separating a beam onto two optical paths 122 and 123. A polarizing beam splitter is used to separate the beam. The intensity aspect ratio (and orientation of the elliptical intensity profile) of the portion of the beam in each optical path is changed differently. The two portions are then recombined so that the intensity profile of beam is polarization dependent. Polarization rotator 127 may used to select the polarization, and thus intensity profile, of output beam 128. Ehrmann et al. also disclose in paragraph [0144] that "element(s) 127 may be a waveplate used to convert to a circular polarization or optical elements to create an unpolarized delivery beam." However, Ehrmann et al. do not disclose the use of the polarization of the laser beam to directly control the shape of the area of the surface machined by the beam.

Yano et al. disclose the use of optical elements, such as a ¼ wave plate to vary the polarization of a laser beam, "chang[ing] a linear polarized beam into a circular polarized beam or an elliptically polarized beam." Col 5, lines, 43-54.

Nishisaka discloses controlling the power supply of an array of semiconductor laser elements 2, as shown in Fig. 1, 2, and 3, to generate output laser beams having specific intensity profiles, as shown in Fig. 4. See Abstract.

Dunsky et al. disclose means for shaping the intensity profile of laser beams as shown in Figs. 5A-5C and 6A-6D.

Ehrmann et al., Yano et al., Nishisaka, and Dunsky et al. do not disclose or suggest, singly or in combination, a feature recited in claim 1 of the present application, namely:

> ...b) focusing the pulse of laser light to the beam spot within a target area of the microstructure workpiece such that the pulse of laser light has a substantially circularly symmetric beam intensity profile at the beam spot;
>
> c) adjusting a polarization of the pulse of laser light such that in the beam spot the pulse of laser light is elliptically polarized and an axis of a polarization ellipse of the pulse of laser light is oriented in the predetermined direction, while maintaining the substantially circularly symmetric beam intensity profile of the pulse of laser light at the beam spot;
>
> d) adjusting an ellipticity of the polarization of the pulse of laser light such that the pulse of laser light has contours of constant

> machining capacity on the surface of the microstructure workpiece,...
> ...while maintaining the substantially circularly symmetric beam intensity profile of the pulse of laser light at the beam spot...
> (Emphasis added.)

This feature of the present invention is described in the specification at paragraphs [0045]-[0049].

The present invention, as recited in claim 1, controls both the polarization properties and the fluence of pulses of laser light so that each pulse of laser light machines an area of the workpiece surface that substantially matches a predetermined shape, without varying the intensity profile of the beam spot.

Ehrmann et al. disclose using modified elliptical beam spots to control the shape of the area of the workpiece surface being machined. Abstract, paragraphs [0046], [0053], [0104], [0139], and claims 13 and 20, etc. Ehrmann et al. do not disclose or suggest controlling the shape of the area of the workpiece surface being machined other than by varying the intensity profile of the beam spot. Although Ehrmann et al. disclose the use of beam polarization in methods for producing beams that elliptical beam intensity profiles and elliptical beam spots, Ehrmann et al. do not disclose or suggest that a "predetermined elliptical shape" can be machined on a workpiece surface using a "pulse of laser light has a substantially circularly symmetric beam intensity profile at the beam spot," as recited in claim 1 of the present application.

Yano et al., Nishisaka, and Dunsky et al. do not disclose the use of polarization in laser machining and, thus cannot overcome the deficiencies of Ehrmann et al. with regard to claim 1 of the present application.

Therefore, for the reasons described above, claim 1 is not be subject to rejection under 35 U.S.C. § 103(a) as unpatentable over Ehrmann et al. in view of Yano et al. and Nishisaka, nor is claim 1 subject to rejection under 35 U.S.C. § 103(a) as unpatentable over Ehrmann et al. in view of Yano et al. and Dunsky et al. As claims 2, 3, and 28 depend from claim 1, these claims are not subject to these rejections as well.

Conclusion

In view of the foregoing amendments and remarks, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1-3 and 28.

Respectfully submitted,

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